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A PILOT PROJECT ON INACTIVATED POLIO VACCINE IN YOGYAKARTA PROVINCE: THE COVERAGE AND TIMELINESS

PILOT PROJECT VAKSIN POLIO INAKTIF DI PROPINSI YOGYAKARTA: CAKUPAN DAN KETEPATAN WAKTU PEMBERIAN

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ABSTRACT

Background: Yogyakarta Province is the only province in Indonesia that piloted IPV immunization since September 2007. Therefore, it is essential to evaluate the implementation of this new program. This study was aimed to determine the coverage and timeliness of the IPV immunization after 2.5 years of its introduction.

Method: A cross sectional study was carried out using the WHO standard cluster sampling to estimate the immunization coverage in urban Yogyakarta City and the remaining rural districts in Yogyakarta Province. The subjects consisted of children aged 12-23 months old and their parents. A questionnaire was used to acquire information from parents/caregivers on demographic, socioeconomic, and IPV immunization status, dates, location, and access of immunization. Epi Info™ 2003 software was used for data entry and analysis.

Result: Overall, 426 children were involved in the study (215 in urban and 211 in rural areas). The coverage for IPV1 through IPV4 was 100%, 99.8%, 99.3%, and 96.7%, respectively. There was no difference in coverage by urban/rural location, parents' education level, number of siblings, and distance to health service. The coverage is very similar to that of survey in 2004 when this province still used oral polio vaccine. The mean ages of IPV administration were 2.3, 3.5, 4.8, and 9.4 and no significant difference among urban and rural areas was found. More than 95% children received IPV immunization at appropriate age.

Conclusion: The IPV pilot project in Yogyakarta Province has been implemented well with high coverage and appropriate timeliness.

Keywords: immunization, polio eradication, IPV, coverage, timeliness

ABSTRAK

Latar belakang: Propinsi Daerah Istimewa Yogyakarta adalah satu-satunya propinsi di Indonesia yang melaksanakan *pilot project* imunisasi IPV sejak September 2007. Evaluasi terhadap program baru ini menjadi sangat penting. Penelitian ini bertujuan untuk menentukan cakupan imunisasi IPV dan ketepatan waktu pemberiannya, setelah 2,5 tahun dimulainya program ini.

Metode: Penelitian potong lintang dilakukan dengan menggunakan metode sampling kluster standar WHO untuk mengetahui cakupan imunisasi di wilayah perkotaan Kota Yogyakarta dan pedesaan di empat kabupaten lain di Propinsi Yogyakarta. Subyek penelitian mencakup anak usia 12-23 bulan dan orang tua mereka. Kuesioner dipergunakan untuk mendapatkan informasi dari orang tua tentang faktor demografi, social ekonomi, status imunisasi IPV, tanggal dan lokasi imunisasi dan akses terhadap layanan imunisasi. Perangkat lunak Epi Info™ 2003 dipergunakan untuk pengolahan dan analisis data.

Hasil: Sebanyak 426 anak ikut dalam penelitian, mencakup 215 anak di perkotaan dan 211 anak di pedesaan. Cakupan imunisasi IPV untuk dosis 1-4 masing-masing 100%, 99,8%, 99,3%, dan 96,7%. Tidak ada perbedaan cakupan berdasarkan lokasi perkotaan/pedesaan, tingkat pendidikan orang tua, jumlah anak, dan jarak ke tempat layanan imunisasi. Angka cakupan tersebut hampir sama dengan yang didapat pada survey tahun 2004 ketika propinsi ini masih menggunakan vaksin polio oral. Rerata umur pemberian IPV dosis 1-4 masing-masing 2,3; 3,5; 4,4; dan 9,4 bulan. Lebih dari 95% anak mendapat imunisasi IPV pada umur yang tepat.

Kesimpulan: Pilot project imunisasi IPV di Propinsi Yogyakarta telah terlaksana dengan baik, dengan angka cakupan tinggi dan umur pemberian yang tepat.

Kata kunci: imunisasi, eradikasi polio, IPV, cakupan, ketepatan

INTRODUCTION

The global strategy to eradicate polio virus has been approaching its last phase. When the eradication of wild poliovirus has been achieved, the public health benefits of routine immunization with oral polio vaccine (OPV) will no longer outweigh the burden of disease, either due to paralysis caused by OPV (vaccine associated paralytic polio, VAPP), or by outbreaks caused by circulating vaccine-derived polioviruses (VDPV) resulting from mutation of the polio vaccine virus. The VDPVs have been reported in many countries, including Indonesia. Once global certification of a polio-free status is achieved, the eventual cessation of OPV use in routine immunization program will become necessary to assure a lasting eradication of polio. However, it requires a good strategy and timely approach. Switching the use of OPV to inactivated polio vaccine (IPV) is one among options for immunization policy in post-eradication era.[1,2,3]

Yogyakarta Province has been considered to fulfill the requirements for the switching of OPV to IPV immunization.[4] The Indonesian Ministry of Health has selected Yogyakarta as the only Province piloted the use of IPV since September 2007. Following this policy, it is important to evaluate the implementation and whether this switch compromises the immunization program. This study was aimed to determine the coverage and timeliness of the IPV immunization after 2.5 years implementation of the pilot program. This study would provide valuable input for all stakeholders for continuation of this program in Yogyakarta as well as its initiation in other provinces in Indonesia.

METHOD

This was a community-based, cross-sectional study. The study population consisted of parents of children aged 12 to 23 months, born and living in the study sites. We applied the standard cluster sampling method of 30 clusters-by-7 subject, as recommended by the World Health Organization (WHO)[5], to determine the coverage of IPV immunization in Yogyakarta Province. The sampling design estimated the immunization coverage within ± 10 percentage points of true proportion with 95% confidence. The population was classified into the municipality of Yogyakarta and the four remaining districts (Bantul, Gunungkidul, Kulonprogo, and Sleman), representing urban and rural areas, respectively. The population was divided into sets of non-overlapping subpopulations. Thirty villages in Yogyakarta City and 30 villages in the remaining four districts were selected. For the selection of clusters, we used a probability proportionate to size approach, i.e. the villages with larger population have a higher probability of being proportionately selected in the survey. We excluded 122 among 391 villages in the four districts from the sampling frame because the recent report of Yogyakarta Central Statistics Bureau considered them as urban villages based on their development level. The second stage of sampling randomly selected a household in 1 cluster (defined as 1 village) from which all eligible subjects were sampled. Experienced interviewers collected the data. The interviewers were trained both in classroom and field practice before data collection. After visiting the first household, the surveyor moved on to the next household and continued these ways until 7 eligible subjects from each village were sampled for the 30 selected villages. A questionnaire was used to acquire information from parents/caregivers on demographic, socioeconomic, and IPV immunization status, dates, location, and access of immunization. The information was mostly acquired by direct interview, whereas the immunization data was obtained from the immunization card. The field work was carried out between July and August 2010. We used Epi Info™ 2003 software for data entry and analysis.

Results

Overall, there were 426 children involved in this study, including 215 in urban Yogyakarta City and 211 children in rural districts. Three hundred and twenty six (84.78%) respondents were parents of the children and 81.3% of respondents were able to show the child's immunization card.

The vast majority of mothers had education level of secondary school, both in urban and rural areas (70.4% and 74.4%, respectively). The proportion of mothers with college/university education level is significantly higher in urban than in rural areas (22.2% vs 8.1%). In both study areas, the fathers are mostly worked in private sector, whereas the mothers were mostly housewives.

Most children received IPV immunization at primary health center (51.4%), with different patterns in urban-rural areas. In urban areas, they received immunization mostly at primary health center (64.8%), followed by private hospital/clinic (18.1%) and private midwife practice (10.2). Meanwhile, in rural areas, private midwife practice being the predominant place (56.9%) for the children getting polio immunization followed by primary health center (37.4%) and private hospital/clinics (3.3%).

Table 1 shows high coverage for all IPV doses, ranging from 96.7% to 100%. No differences in coverage were found when the data were stratified by urban or rural areas, distance to immunization service, and number of sibling.

Table 1. Coverage (%) of IPV immunization by demographic factors

IPV	Area		Access distance		Siblings		Overall
doses	Urban	Rural	≤ 5 km	>5 km	≤ 2	> 2	% (95% CI)
IPV 1	100	100	100.0	100.0	100.0	100.0	100.0 (100.0-100.0)
IPV 2	99.5	100	99.8	100.0	99.7	100.0	99.8 (99.3-100.2)
IPV 3	99.5	99.1	99.3	100.0	99.4	98.6	99.3 (98.5-100.1)
IPV 4	99.5	97.2	96.5	100.0	96.9	97.1	96.7 (95.2-98.3)

In comparison to the immunization coverage survey conducted in 2004 for OPV, the present survey shows comparable high coverage of polio immunization (Table 2).

Average ages of IPV administration for doses 1 through doses 4 are 2.3, 3.5, 4.8, and 9.4 months, respectively, and very similar in both urban and rural areas (Table 3)

In this study the IPV immunization was considered inappropriate when the first dose is given at age less than 6 weeks and the interval between doses are less than 24 days. It is based on the current recommendation that the first dose of IPV should be given at age of 6 weeks or more. The minimum interval between doses is 4 weeks but administration within 4 days earlier than the minimum recommended interval is counted valid. Table 4 shows only small portion of children received IPV immunization at inappropriate age (less than 5%).

DISCUSSION

The Indonesian Ministry of Health has chosen Yogyakarta Province to introduce the IPV immunization program because of its high rates of vaccine coverage, excellent program for surveillance of acute flaccid paralysis (AFP) and a sewage system that allows for environmental surveillance of poliovirus. Previous survey has indicated a very high coverage of the OPV immunization (99.5% in average). Surveillance of acute flaccid paralysis (AFP) in Yogyakarta in 2006 found AFP cases of 3/100.000 children aged under 15 years old and all were confirmed as non-polio cases. Environmental sewage surveillance found the presence of circulating vaccine-type polio virus from all three types, in line with the high coverage of OPV immunization. In addition, serological study in 2004 revealed the presence of protective level antibodies against all type of polio viruses in under-five children.[4]

This study showed very high coverage of the newly introduced IPV in Yogyakarta Province, which is beyond 96% for all IPV doses both in urban and rural areas. This coverage is very similar to that of previous program when this Province applied polio immunization using OPV. This achievement is much impressive since switching policy from OPV to IPV in several countries has been often compromise the coverage, especially in developing countries. In 1980s, Senegal piloted the use of IPV in one of its region in combined DTP-IPV form.[6] The program included two doses of IPV at interval of 6 months. The two IPV doses induced protective antibody in 89% children but the coverage was as low as 45% and 26% for the first and second IPV doses, respectively. This poor achievement partly contributed to the occurrence of polio outbreaks in the region 6-7

Table 2. Comparison of polio immunization coverage in 2004 and 2010 surveys*

Polio vaccine doses	Urban area		Rural area	
	2004 (%)	2010 (%)	2004 (%)	2010 (%)
Polio 0¶	100	-	99.5	-
Polio 1	100	100	99.5	100
Polio 2	99.5	99.5	99.5	100
Polio 3	98.6	99.5	99.5	99.1
Polio 4¶	-	96.3	-	97.2

* Polio vaccine in 2004 and 210 surveys represent OPV and IPV immunizations, respectively.

¶ Polio-0 in 2004 survey indicates OPV given soon after birth, whereas polio-4 in 2010 survey does IPV given at 9 months old, simultaneously with measles vaccine.

Table 3. Age of IPV administration

IPV doses	Age of administration (months)								
	Urban			Rural			Overall		
	Range	mean	SD	Range	mean	SD	Range	mean	SD
IPV 1	0.6-8.5	2.3	0.6	0.6-6.4	2.3	0.5	0.6-8.5	2.3	0.6
IPV 2	2.2-11.1	3.6	0.8	2.0-7.6	3.5	0.7	2.0-11.1	3.5	0.8
IPV 3	3.4-15.9	4.9	1.3	3.1-9.6	4.7	0.9	3.1-15.9	4.8	1.1
IPV 4	5.1-18.7	9.8	1.6	4.5-12.3	9.3	0.9	4.5-18.7	9.4	1.8

Table 4. Timeliness of IPV administration

Inappropriate timeliness	Urban	Rural	Overall
IPV1 < 6 weeks old	1.2 %	2.3 %	1.4 %
Interval IPV1-IPV2 < 24 days	0.6%	0.6%	0.6%
Interval IPV2-IPV3 < 24 days	0.6%	0.6%	0.6%
Interval IPV3-IPV4 < 24 days	1.3%	2.4%	1.8%

years after the program. Similar finding was shown in the introduction of a combined DTP–IPV vaccination in Burkina Faso, Africa.[7] A two-dose schedule induced antibodies in 90% of children, which persisted for more than 2 years, but the vaccination coverage was low (<60%) and circulation of poliovirus in the community was not interrupted.

The homogeneous high coverage results, however, precluded our ability to analyze the influence of demographic and socioeconomic factors, such as urban/rural residence, geographical access, maternal and parental education level and employment, on the coverage. Many studies showed that the lower mother's education level is associated with lower immunization coverage. Demographic factors, such as parent's employment, distance to health service, and socioeconomic level show less consistent association.[8-12] In this study, neither parents' education nor demographic factor are associated with the coverage. In our study the influence of education level may be overwhelmed by good accessibility to information on vaccination. It may partly reflect the role of health worker in making the community aware on the importance of vaccination. The relatively small size of this province also facilitates access to information and immunization services.

In term of place of immunization, while children in urban area mostly received immunization in primary health center (64.8%), in rural areas private midwife practice is being the main place (56.9%), and then just followed by primary health center (37.4%). This fact is especially interesting considering that the immunization service in private midwife is not free of charge, in contrast with that of in primary health center. Additional interview during the survey revealed that flexibility in service time for immunization is the main reason for parents to choose the private midwife practices. In fact, the private midwives usually provide immunization service in looser schedule and even in many cases they open the service during holidays. The data suggest that the time flexibility overweight the consequence for paying the service. However, we have no further information to explain why this preference, surprisingly, predominantly exists in rural, rather than in urban areas. With a general assumption that the respondents in urban area have higher income and posing more busy life rhythm, this phenomenon should be viewed in other perspective. It is probably that under the local culture, the community has more personal and psychological attachment with the midwives compared with the primary health center or other health center as an institution, though most of midwives also serve as personnel in PHC or hospital/clinics.

Some previous studies indicated that high vaccination coverage does not necessarily imply timely vaccination. It is shown that vaccination coverage alone is not a good indicator for age-appropriate vaccination.[13-15] During the IPV pilot project in Yogyakarta Province, the Ministry of Health recommended the vaccine to be administered at 2, 3, 4, and 9 months old. The first three doses are administered together with combined DTP-Hepatitis B vaccine, while the fourth dose with measles vaccine. Some children may receive IPV in combined form with DPaT or DPaT+Hib, which are not subsided by EPI program. In this case, they may follow the schedule with on 2-month-interval (at 2, 4, and 6 months old), and the fourth dose at 9 months old simultaneously with measles vaccine. In assessing the timeliness of IPV administration we look at the mean age of administration and that the first dose should not be given at age less than 6 weeks and the minimum interval between doses is 4 week (28 days). Doses given within 4 days before the minimum age, thus at interval 24 day or more, are considered accepTable.[16] We do not include the delay of vaccination as indicator for timeliness since, unlike in AAP recommendation, the Indonesian national EPI schedule does not strictly define the longest interval between IPV doses that remain accepTable. Moreover, there is schedule recommended by the IPS that uses an optimal interval between doses of 8 weeks, instead of a minimum interval of 4 weeks as in the national EPI recommendation. This difference complicates us in determining the definition of delay of IPV immunization for this study. In this study, the mean ages of IPV administration are very close to the recommended schedule (2.3, 3.5, 4.8, and 9.4 months for IPV1, IPV2, IPV3, and IPV4, respectively). In our population, only few children (<5%) received IPV vaccination inappropriately (too early administration of the first dose and to close interval between doses). Too early administration and too close spacing between doses of IPV would result in suboptimal immune response. In our study, more than 95% children get the IPV immunization timely, higher than that shown in several studies in other countries. As comparison, the timely polio vaccination in Uganda (using OPV) for doses 1-3 ranged between 67-81%.[17] A study in United States[18] showed approximately 32% children receiving IPV beyond the recommended schedule. However, this study included the immunization delay as one of indicator for inappropriate immunization. Timely vaccination, beside its

high coverage, prevents the children from unprotected space, in which they would pose higher risk for getting infection.

The present study strongly indicated that the pilot IPV immunization in Yogyakarta Province has been implemented with high compliance and punctuality. This result, in couple with that of seroprevalence study that was carried out separately, provides strong message to all stakeholders for the feasibility of the IPV program to be continued in Yogyakarta Province. This success experience will be a good lesson for other regions in Indonesia when the time for switching to IPV immunization comes.

To conclude, the pilot program of IPV immunization in Yogyakarta Province has been well implemented with impressive coverage and timeliness and is comparable with that of the previous live oral polio vaccine (OPV). The shift from oral live polio vaccine to the current inactivated polio vaccine does not compromise the coverage, partly indicating a high acceptance of the IPV immunization.

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